

Application Serial No.: 10/820,236
Attorney Docket No.: 2156-608A

Examiner: C. Sullivan
Art Unit: 1756

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LISTING OF CLAIMS

1. (Currently amended) A method of producing a metal pattern on a substrate comprising the steps of:

- a) providing a first photoimageable dry-film layer on the substrate;
- b) laminating a second photoimageable dry-film layer directly over the first photoimageable dry-film layer;
- c) placing a negative image of the desired metal pattern over the second photoimageable dry-film layer and exposing the first photoimageable dry-film layer and the second photoimageable dry-film layer to actinic radiation;
- d) developing off uncured areas of the first photoimageable dry-film layer and the second photoimageable dry-film layer with a developer capable of developing off uncured areas of both the first photoimageable dry-film layer and the second photoimageable dry film layer to produce an image on the substrate;
- e) depositing metal onto the substrate, wherein the metal is deposited over both the patterned areas and unpatterned areas of the substrate; and
- f) stripping the first photoimageable dry-film layer and the second photoimageable dry-film layer from the substrate to leave the metal pattern on the substrate;
wherein the first photoimageable dry-film layer has a faster development time than the second photoimageable dry-film layer and/or the curing speed of the first photoimageable dry-film layer is slower than the curing speed of the second photoimageable dry-film layer.

2. (Canceled)

3. (Currently amended) The method according to claim 1 or 2, wherein the development dwell time of the first photoimageable dry-film layer is between about 40 and about 60 seconds and the development dwell time of the second photoimageable dry-film layer is between about 80 and about 120 seconds.

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4. (Previously presented) The method according to claim 1, wherein the curing speed of the first photoimageable dry-film layer is between about 30 and about 100 mJ and the curing speed of the second photoimageable dry-film layer is between about 5 and about 20 mJ.

5. (Previously presented) A method according to claim 1, wherein the first photoimageable dry-film layer and the second photoimageable dry-film layer are each formulated from a composition comprising one or more binders, one or more monomers, a photoinitiator, and a suitable solvent.

6. (Original) A method according to claim 5, wherein the one or more binders are selected from the group consisting of (meth)acrylic acid, itaconic acid, ethyl(meth)acrylate, n-butyl (meth)acrylate, propyl (meth)acrylate, methyl (meth)acrylate, octyl acrylate, n-hexyl acrylate, t-butyl acrylate, secbutyl acrylate, isobutyl acrylate, 2-ethyl hexyl acrylate, styrene, isobutyl methacrylate, substituted styrenes, and vinyl esters.

7. (Original) A method according to claim 5, wherein the one or more monomers are selected from the group consisting of acrylic and methacrylic acid and acid esters, vinyl ethers, polyester acrylates, and polyurethane acrylates.

8. (Original) A method according to claim 7, wherein the one or more monomers are selected from the group consisting of allyl (meth)acrylate, tetrahydrofurfuryl (meth)acrylate, isodecyl (meth)acrylate, 2(2-ethoxyethoxy) ethyl (meth)acrylate, stearyl (meth)acrylate, lauryl (meth)acrylate, 2-phenoxyethyl (meth)acrylate, glycidyl (meth)acrylate, isobornyl (meth)acrylate, tridecyl (meth)acrylate, isoocetyl (meth)acrylate, caprolactone (meth)acrylate, polyethylene glycol (meth)acrylate, propylene glycol (meth)acrylate, ethylene glycol (meth)acrylate, 1,3-butylene glycol di(meth)acrylate, 1,6-hexanediol di(meth)acrylate, neopentyl glycol di(meth)acrylate, polyethylene glycol

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di(meth)acrylate, polypropylene glycol di(meth)acrylate, ethoxylated A di(meth)acrylate, propoxylated bisphenol A di(meth)acrylate, alkoxylated cyclohexane dimethanol di(meth)acrylate, cyclohexane dimethanol di(meth)acrylate, trimethylolpropane tri(meth)acrylate, ethoxylated trimethylolpropane tri(meth)acrylate, propoxylated trimethylolpropane tri(meth)acrylate, tris (2-hydroxy ethyl) isocyanurate tri(meth)acrylate, pentaerythritol tri(meth)acrylate, ethoxylated glycerol tri(meth)acrylate, propoxylated glycerol tri(meth)acrylate, pentaerythritol tetra(meth)acrylate, ethoxylated pentaerythritol tetra(meth)acrylate, propoxylated pentaerythritol tetra(meth)acrylate, dipentaerythritol penta(meth)acrylate, dipentaerythritol hexa(meth)acrylate, polyester (meth)acrylates, polyurethane (meth)acrylates, and combinations of the foregoing.

9. (Original) A method according to claim 5, wherein the photoinitiator is selected from the group consisting of benzoin ethers, benzil ketals, acetophenones, benzophenones, and combinations of the foregoing.

10. (Previously presented) A method according to claim 5, wherein the composition that makes up the first photoimageable dry-film layer or the second photoimageable dry-film layer further comprises one or more additives selected from the group consisting of adhesion promoters, stabilizers, flow additives, surfactants, and other additives.

11. (Original) The method according to claim 5, wherein the composition is coated over a carrier sheet, and the solvent is subsequently removed.

12. (Original) The method according to claim 11, wherein the carrier sheet is selected from the group consisting of polyester and polyethylene terephthalate.

13. (Original) The method according to claim 11, wherein a removable protective layer is applied to the top of the composition.

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14. (Previously presented) The method according to claim 13, wherein the first photoimageable dry-film layer is applied to the substrate by lamination using pressure, heat, or heat and pressure, and the protective cover layer is removed.

15. (Previously presented) The method according to claim 14, wherein the second photoimageable dry-film layer is applied over the first photoimageable dry-film layer by lamination using pressure, heat, or heat and pressure, and the negative image of the desired metal pattern is applied over the second photoimageable dry-film layer with the protective cover layer still in place.

16. (Previously presented) The method according to claim 1, wherein after development, the second photoimageable dry-film layer overhangs the first photoimageable dry-film layer on the substrate.

17. (Original) The method according to claim 1, wherein the metal layer is deposited by sputter coating.

18. (Original) The method according to claim 17, wherein the metal is gold.

19. (Previously presented) The method according to claim 1, wherein the step of stripping the first photoimageable dry-film layer and the second photoimageable dry-film layer from the substrate comprises using a caustic solution or an amine stripping solution.

20. (Previously presented) The method according to claim 1, wherein the first photoimageable dry-film layer has a breaking point of about 30% and the second photoimageable dry-film layer has a breaking point of about 60%.

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